

This thesis addresses the measurement of centre-of-mass energy spread $\sigma_{E_{\text{CMS}}}$ in the Belle II experiment. A novel method using the rapidity of muons from $e^+e^- \rightarrow \mu^+\mu^-$ interactions was developed. The method involves convolution techniques to deconstruct detector output into detector resolution, physical interaction, and beam energy spread components. Validation through Monte Carlo simulations and application to real data showed $\sigma_{E_{\text{CMS}}}$ of 5.28(1) MeV, closely aligning with other measurements. This approach offers improved precision and reliability over traditional methods, enhancing the accuracy of particle mass measurements. The results support more precise determinations of fundamental parameters, advancing our understanding of the Standard Model.